# Evaluation Board

# EVA 120/120C

User Manual V1.05 Aug-08

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## Revision History

The following major modifications and improvements have been made to the first version of this document:

| No | Major Changes |
|---|---|
| 1.01 | Port X3-2 corrected in chapter 4.2 |
| 1.02 | Editorial changes |
| 1.03 | Note added for use of WAKE button (example 1 and 3) |
| 1.04 | Table in chapter 4.2 corrected |
| 1.05 | Application note for optical interface added |
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**Important!**

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EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed.

Packing: Please use the recycling operators known to you. By agreement we will take packing material back if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or that we are not obliged to accept, we shall have to invoice you for any costs incurred.

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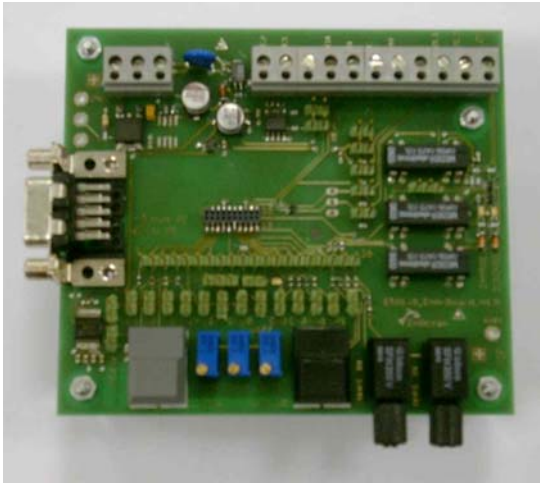
# 1. INTRODUCTION

EVA 120 is an evaluation kit for the solar powered sensor module STM110. EVA 120 contains an evaluation board, a USB adapter and an STM110 module. The evaluation board is designed to allow easy evaluation of STM110 product features and to support the development of customer specific products based on STM110. The main features of the evaluation board are listed below. A US version for 315MHz is also avaliable. EVA 120C contains an STM 110C module.



**Features of the evaluation board:**

- Supply of STM110 via solar cell, battery or external power supply
- External control of charge / discharge cycles
- Optical interface for WAKE inputs
- Push-button connected to WAKE inputs
- Push-button to initiate learn telegram
- RS232 interface and USB adapter for configuration of the module
- Jumpers for setting wake and transmit cycles
- Potentiometers to set analog values, jumpers for digital inputs
- Buffered measurement of V_SC1 and V_SC2
- Transmission indicator LED
- Temperature range –25°C / +65°C

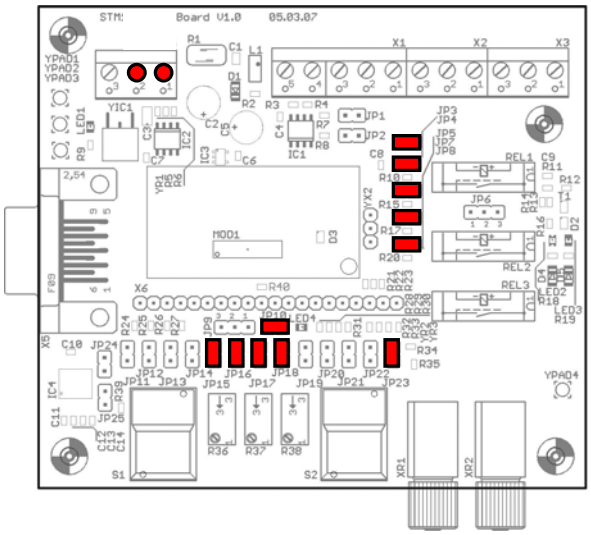
| Type | EnOcean Ordering Code | Remarks |
|---|---|---|
| **EVA 120** | **S3004-G120** | EU version containing STM110 |
| **EVA 120C** | **S3034-G120** | US version containing STM110C |

## 2. GETTING STARTED

Below some examples for the configuration (jumper settings) of EVA120 are given. For more elaborate configurations please refer to the pin description in chapter 4 and the schematics of the board in chapter 5.

### Example 1 (Default Configuration):

- Operate from 9V external supply
- Transmit LED connected
- 1s wake up, transmit every wake up
- WAKE and LRN button available
- Use potentiometers on AD_0..2
- No RS232

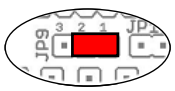


Please make sure the optical inputs are closed (e.g. by a piece of cable inserted into the optical connector) when using the WAKE button!

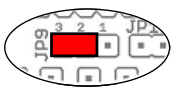
### Example 2:

- Operate from 9V external supply
- Use RS232 interface
- Use WinEtel software with plugin

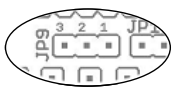
Enter serial mode

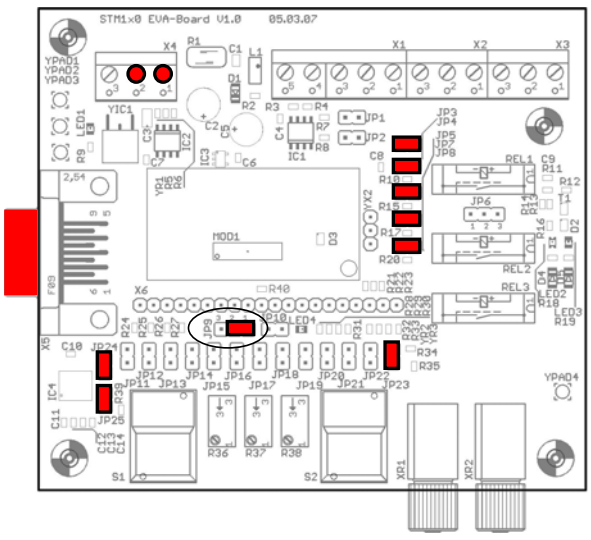


Leave serial mode



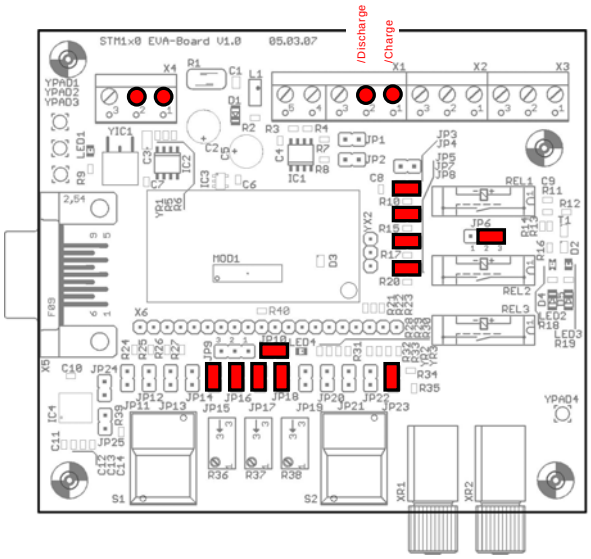
Operating mode





## Example 3:

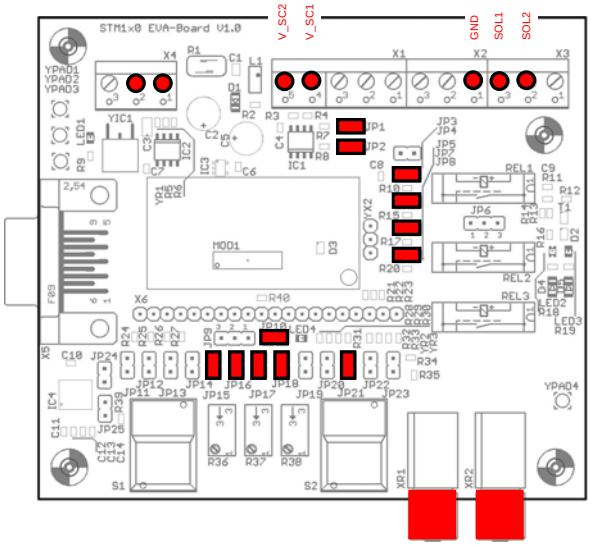
- Operate from 9V external supply
- Simulate charge / discharge cycle @ 5.5V
- Transmit LED connected
- 1s wake up, transmit every wake up
- WAKE and LRN button available
- Use potentiometers on AD_0..2




Please make sure the optical inputs are closed (e.g. by a piece of cable inserted into the optical connector) when using the WAKE button!

## Example 4:

- Operate board from 9V external supply
- Operate STM110 from solar cell
- Wake module via optical interface
- Measure V_SC1 and V_SC2 via voltage follower
- Transmit LED connected
- 100s wake up, transmit every wake up
- Use potentiometers on AD_0..2



# 3. USING THE WINETEL PLUGIN

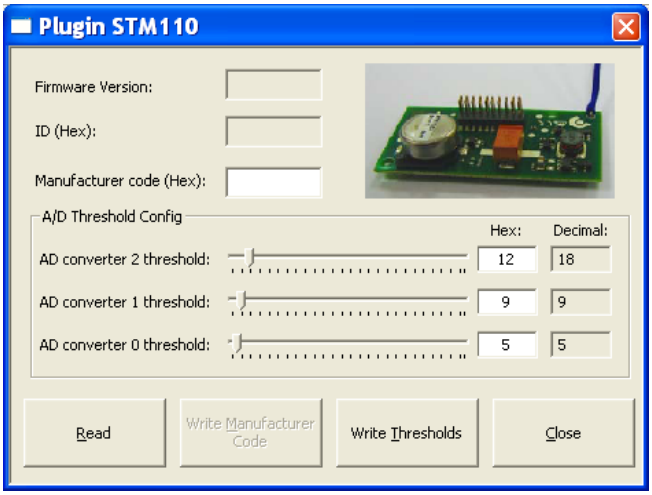
EnOcean provides a tiny application which allows to read and write the configuration of the module.

**Installation procedure:**

- Insert CDROM
- Launch the setup program of WinEtel and follow instructions
- If available (see note) copy the key file “STM110ManufacturerCode.key” to the WinEtel installation directory (as shown in the title bar without “Log\”)
- If the FTDI USB to RS232 adapter shall be used connect adapter to PC and follow Windows instructions to install driver. The driver is provided by EnOcean on CDROM

**Start Plugin:**

- Run WinEtel
- Select communication port (COM port number must be ≤10!)
- Click on “CONNECT”
- Click on “Plugins->Load Plug Ins”
- Click on “Plugins->Plugin STM110”

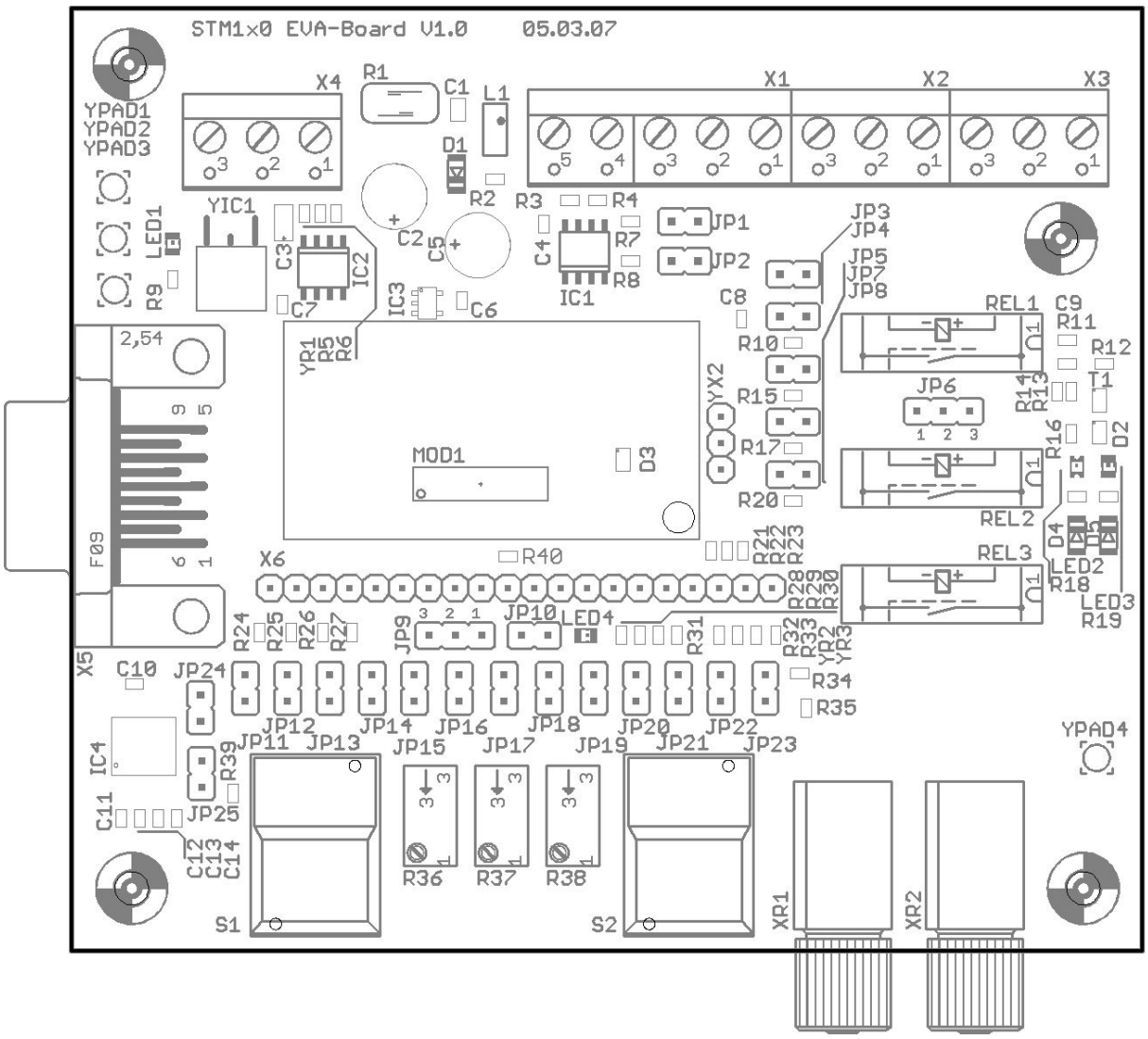



Enter serial mode on the EVA 120 board as described above in Example 2.

It is now possible to read the configuration from the module and to modify the thresholds of the AD converters or to write the manufacturer code.

The button “Write manufacturer code” is only available if the key file “STM110ManufacturerCode.key” is present in the WinEtel installation directory. This key file is only available to customers having signed a special agreement with EnOcean on usage of the manufacturer code!

# 4. PIN DESCRIPTION




## 4.1. Connection to the STM110

Via pinheader X6 any pin of the STM-module can be connected and used for customer applications. Pin-numbers and names correspond to the original connector of the STM110.

## 4.2. Power supply and power measurement

Do not connect more than one STM110-supply at a time; doing so might damage either the internal and/or external power supply circuits or the STM-module, or might lead to a fire (laboratory use only: no current limit included)!

| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| Auxiliary supply | X4 | X4-1 = positive input<br>X4-2 = negative input | +9 to +12Vdc, 50mA max.<br>Reverse voltage protection included; always use SELV power supply equipment and avoid over-voltage and extensive reverse polarity conditions.<br>Must be connected to supply the V_SC1 measurements and charge/discharge blocks, for internal (fixed) module supply and serial communication during suppliers code setting and readout.<br>May be left open for battery or solar powered operation of the STM110 where no read-back of the supply voltages is wanted. |
| Solar powered operation | X3, X2 | X3-3 = positive input small solar cell area<br>X3-2 = positive input large solar cell area<br>X2-1 = GND (0V), negative pin for both areas | Input voltage levels according to the STM110 datasheet.<br>No over-current, over-voltage or reverse voltage protection included! |
| Battery supply | BAT100 | Set battery into battery holder on the bottom side<br>X2-2 = positive external battery input<br>X2-1 = negative external battery input | Input voltage levels according to the STM110 datasheet.<br>Only use CR2032 lithium batteries for internal use and do not both connect internal and external power (JP3 must be open! Otherwise battery will be discharged!).<br>No over-current, over-voltage or reverse battery / voltage protection included! |

| | | | |
|---|---|---|---|
| External module supply | X2 | Set JP3 open<br>X2-3 = positive external battery input<br>X2-1 = negative external battery input | Input voltage levels according to the STM110 datasheet.<br>No over-current, over-voltage or reverse voltage protection included! |
| Internal module Supply | JP3 | Power auxiliary supply via X4<br>JP3 closed → STM110 will be supplied via VCC | Internal supply (fixed to VCC = 3.3V nom.) provided, if auxiliary supply input via X4 is powered.<br>Internal supply recommended for serial connection mode. |
| V_SCx measurement | X1 | Power auxiliary supply via X4<br>Set both JP1 and JP2 closed<br>(set to open, if no measurement is necessary)<br>X1-4 = buffered positive output of V_SC1<br>X1-5 = buffered positive output of V_SC2<br>X1-3 = GND (0V) | Measurement of V_SCx needs auxiliary supply via X4.<br>Open JP1 and JP2, if measurement of V_SCx is not wanted and/or no auxiliary supply via X4 can be provided (otherwise the STM-module internal energy storage capacitors will be discharged by IC1). |
| Charging of energy storage | X1 | Power auxiliary supply via X4<br>Connect X1-1 to X1-3 (GND) for charging<br>leave open to stop charging | Only V_SC2 (gold cap) will be charged directly; V_SC1 is charged via an module-internal diode (included in the STM110 module).<br>Recommendation: drive X1-1 by an open collector output.<br>Do not connect X1-1 to voltages higher than VDD or below GND. |

| | | | |
|---|---|---|---|
| Discharging of energy storage | X1 | Power auxiliary supply via X4<br>Connect X1-2 to X1-3 (GND) for discharging leave open to stop discharging | To provide fast discharge both V_SC1 and V_SC2 (gold cap) will be discharged directly.<br>Recommendation: drive X1-2 by an open collector output.<br>Do not connect X1-2 to voltages higher than VDD or below GND. |

## 4.3. Digital IO-setting

D2 and D3 are multifunctional pins: usage for serial communication data / clock lines and digital IO. Do not set JP13 and JP14 to closed, if serial communication shall be initiated!

| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| DI_0 | JP12 | Open | DI_0 = NC *) |
| | | Closed | DI_0 = GND |
| DI_1 | JP11 | Open | DI_1 = NC *) |
| | | Closed | DI_1 = GND |
| DI_2 | JP14 | Open | DI_2 = NC *) |
| | | Closed | DI_2 = GND |
| DI_3 | JP13 | Open | DI_3 = NC **) |
| | | Closed | DI_3 = GND |
| | S1 | Pressed | DI_3 = GND |
| | | Released | DI_3 = NC ***) |

*) NC = logical HIGH via STM110-internal pull-up resistor

**) NC = logical HIGH via STM110-internal pull-up resistor, if S2 is released

***) NC = logical HIGH via STM110-internal pull-up resistor, if JP13 is set to open

## 4.4. Setting of timer interval and telegram frequency

| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| CP_0 | JP20 | Open | CP_0 = NC *) |
| | | Closed | CP_0 = GND |
| CP_1 | JP22 | Open | CP_1 = NC *) |
| | | Closed | CP_1 = GND |
| CW_0 | JP19 | Open | CW_0 = NC |
| | | Closed | CW_0 = GND |
| CW_1 | JP21 | Open | CW_1 = NC |
| | | Closed | CW_1 = GND |

*) NC = logical HIGH via STM110-internal pull-up resistor

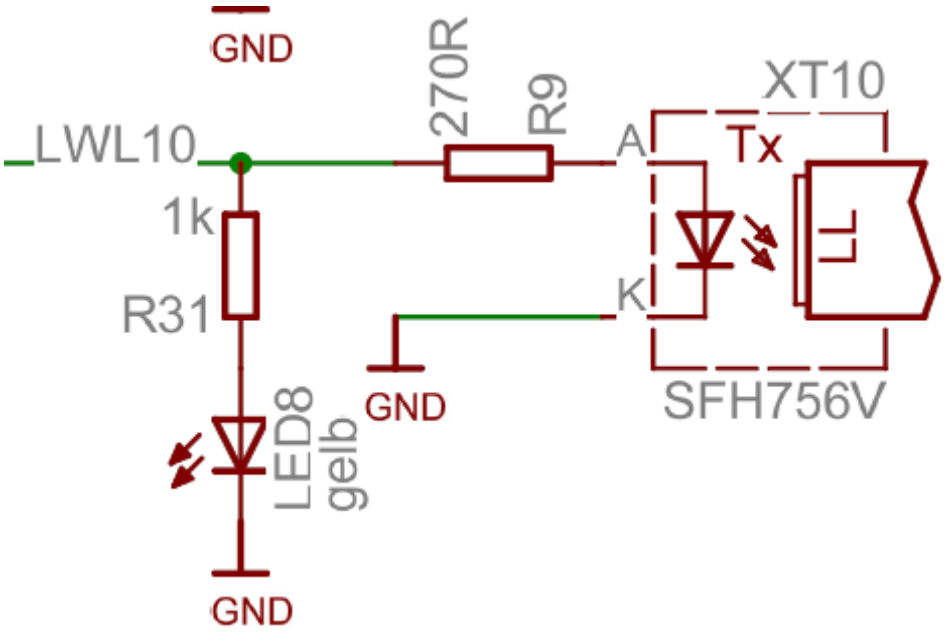
## 4.5. Setting and usability of wake-up inputs

| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| Manual wake-up | JP23 | Open | Manual wake-up disabled<br>Optical wake-up possible *) |
| | | Closed | Manual wake-up enabled, no optical wake-up<br>If S2 is released the WAKE input is connected to GND, /WAKE is NC<br>If S2 is pressed the /WAKE input is connected to GND, WAKE is NC |
| | S2 | Pressed | Manual wake-up initiated, if JP23 is closed |
| | | Released | Manual wake-up initiated, if JP23 is closed |
| /WAKE_IN (optical) | XR1 | Dark | /WAKE = NC *), **) |
| | | Illumination | /WAKE = GND *), **) |
| WAKE_IN (optical) | XR2 | Dark | WAKE = NC *), **) |
| | | Illumination | WAKE = GND *), **) |
| Learn Key | S1 | Pressed | D3 is set to logical LOW which indicates a learn telegram (see STM1x0 user manual) |

*) If optical inputs remain unused close the optical fibre input (otherwise environmental light might lead to unwanted wake-up of the STM module).

As optical transmitters (couplers) different light emitter devices, can be used e.g. the SFH756V.

Typical connection diagram:




**) WAKE and /WAKE must provide complementary logical levels; for timing aspects please refer to the corresponding chapter of the STM110 manual.

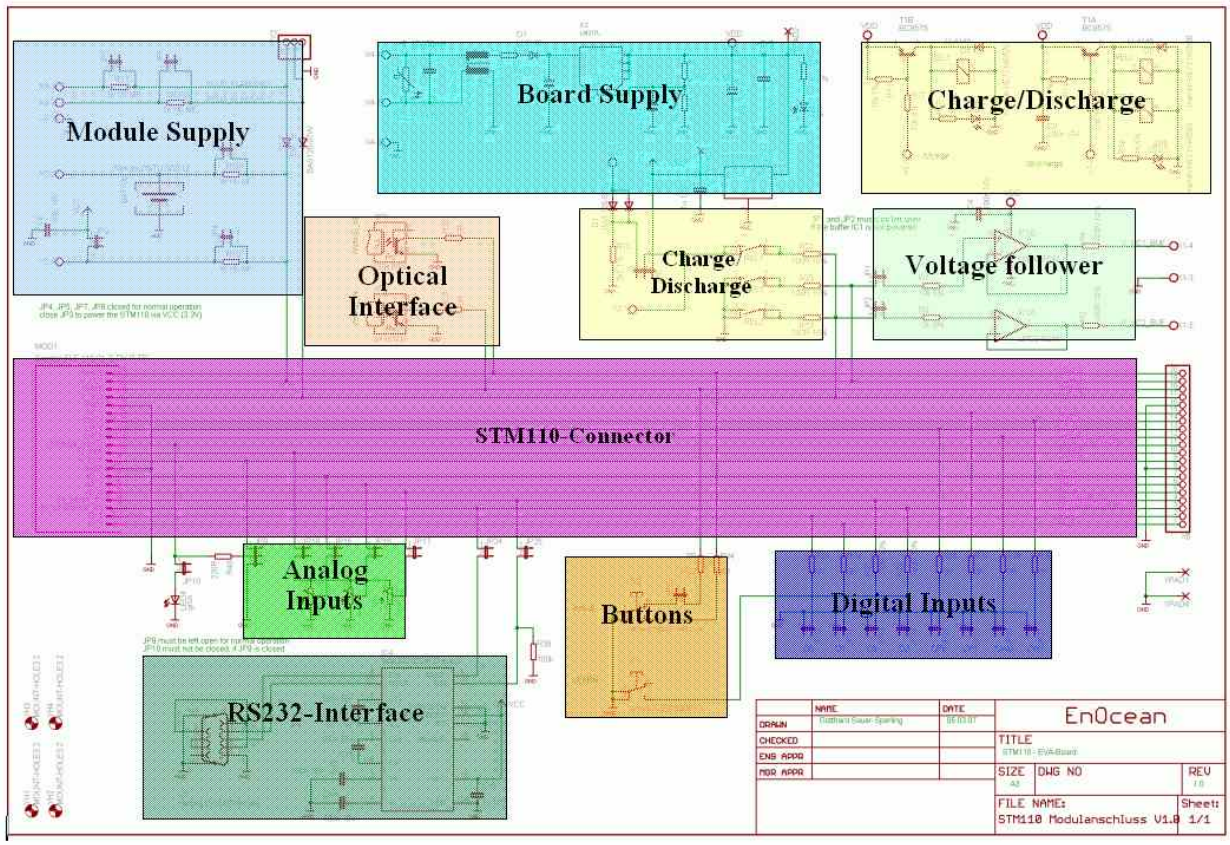
## 4.6. Analog inputs

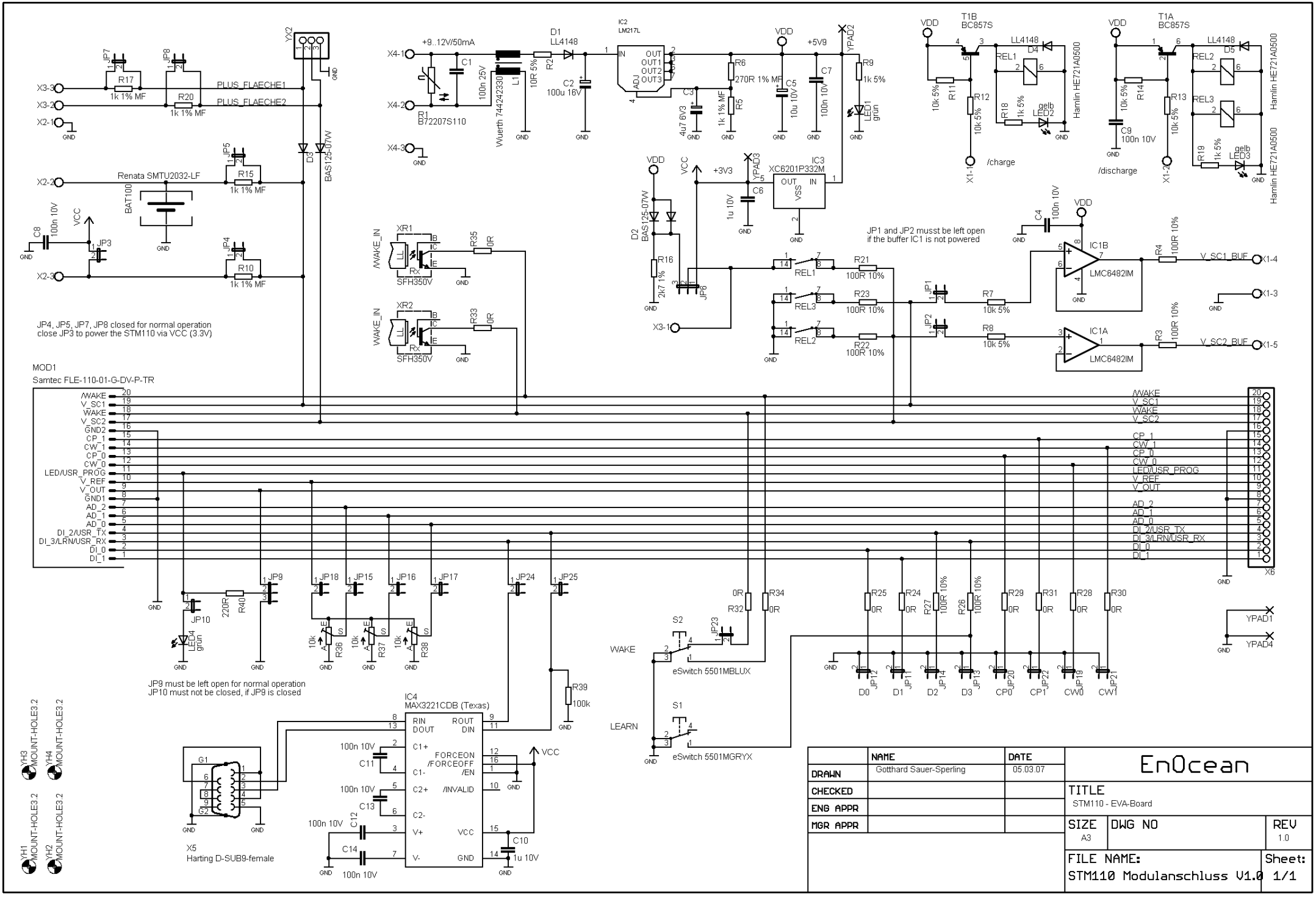
| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| V_REF | JP18 | Open | All potentiometers (R36 to R38) are disconnected (necessary if custom application shall be used via X6); no load at V_REF |
| | | Closed | Potentiometer reflect to the (pulsed) voltage of the V_REF-output |
| AN_0 | JP17 | Open | Potentiometer R38 is disconnected (necessary if custom application shall be used via X6) |
| | | Closed | Potentiometer R38 is connected to AN_0 (to use the V_Ref-pulse JP18 must be set to closed) |
| AN_1 | JP16 | Open | Potentiometer R37 is disconnected (necessary if custom application shall be used via X6) |
| | | Closed | Potentiometer R37 is connected to AN_1 (to use the V_Ref-pulse JP18 must be set to closed) |
| AN_2 | JP15 | Open | Potentiometer R36 is disconnected (necessary if custom application shall be used via X6) |
| | | Closed | Potentiometer R36 is connected to AN_2 (to use the V_Ref-pulse JP18 must be set to closed) |

## 4.7. Serial communication and led output

| Signal / Function | Port | Setting | Description |
|---|---|---|---|
| LED | JP10 | Open | LED4 is inactive, LED-input can be used to switch to serial communication mode |
| | | Closed | LED4 will be lighted with each RF transmission (JP9 must be left open) |
| LED-V_OUT | JP9 | Open | LED4 can be used for RF transmission indication |
| | | 1-2 | Activate serial mode; serial communication via X5 possible |
| | | 2-3 | Stop serial mode; JP9 must be re-opened afterwards! |
| Rx_OUT | JP24 | Open | Serial communication disabled (necessary for customer application via X6) |
| | | Closed | Serial communication via X5 possible |
| Tx_IN | JP25 | Open | Serial communication disabled (necessary for customer application via X6) |
| | | Closed | Serial communication via X5 possible |

# 5. SCHEMATICS




JP4, JP5, JP7, JP8 closed for normal operation
close JP3 to power the STM110 via VCC (3.3V)
JP1 and JP2 musst be left open
if the buffer IC1 is not powered
JP9 must be left open for normal operation
JP10 must not be closed, if JP9 is closed
MOD1
Samtec FLE-110-01-G-DV-P-TR
X5
Harting D-SUB9-female
IC4
MAX3221CDB (Texas)
S2
S1
eSwitch 5501MBLUX
eSwitch 5501MGRYX
WAKE
LEARN
Renata SMTU2032-LF
+9..12V/50mA
+3V3
+5V9
/charge
/discharge
V_SC1_BUF
V_SC2_BUF
EnOcean
DRAWN
Gotthard Sauer-Sperling
05.03.07
CHECKED
ENG APPR
MGR APPR
TITLE
STM110 - EVA-Board
SIZE
A3
DWG NO
REV
1.0
FILE NAME:
STM110 Modulanschluss V1.0
Sheet:
1/1